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# DATA SHEET

## 74F804, 74F1804
Hex 2-input NAND drivers

Product specification

1990 Sep 14

IC15 Data Handbook

Philips
Semiconductors

PHILIPS

# Hex 2-input NAND drivers 74F804/1804

## FEATURES

- High capacitive drive capability
- Choice of configuration
  Corner $V_{CC}$ and GND – 74F804
  Center $V_{CC}$ and GND – 74F1804
- Typical propagation delay of 2.5ns

| TYPE | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT ( TOTAL) |
|---|---|---|
| 74F804 | 2.5ns | 9mA |
| 74F1804 | 2.5ns | 9mA |

## INPUT AND OUTPUT LOADING AND FAN OUT TABLE

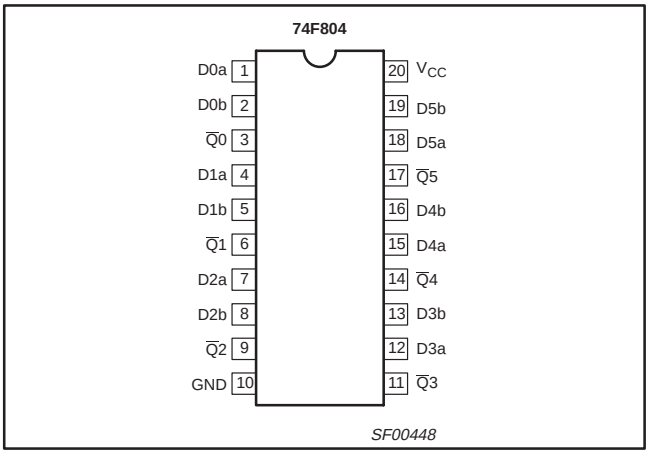
| PINS | DESCRIPTION | 74F (U.L.) HIGH/LOW | LOAD VALUE HIGH/LOW |
|---|---|---|---|
| Dna – Dnb | Data inputs | 1.0/0.033 | 20µA/20µA |
| $\overline{Q}0$ – $\overline{Q}5$ | Data outputs | 2400/80 | 48mA/48mA |

**NOTE:** One (1.0) FAST unit load is defined as: 20µA in the high state and 0.6mA in the low state.

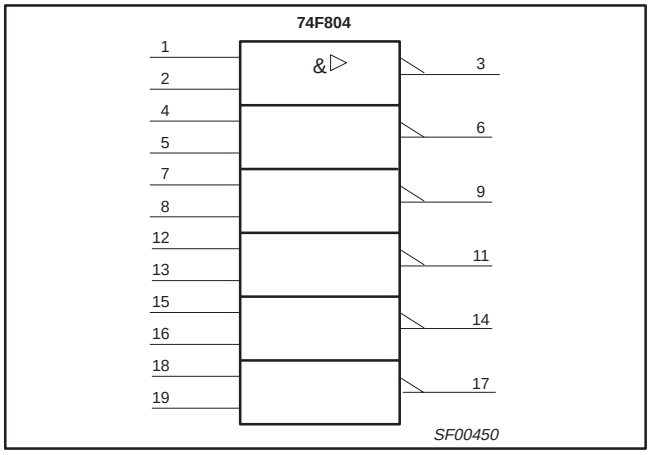
## ORDERING INFORMATION

| DESCRIPTION | ORDER CODE<br>COMMERCIAL RANGE<br>$V_{CC}$ = 5V ±10%, $T_{amb}$ = 0°C to +70°C | PKG DWG # |
|---|---|---|
| 20–pin plastic DIP | N74F804N, N74F1804N | SOT146-1 |
| 20–pin plastic SOL | N74F804D, N74F1804D | SOT163-1 |

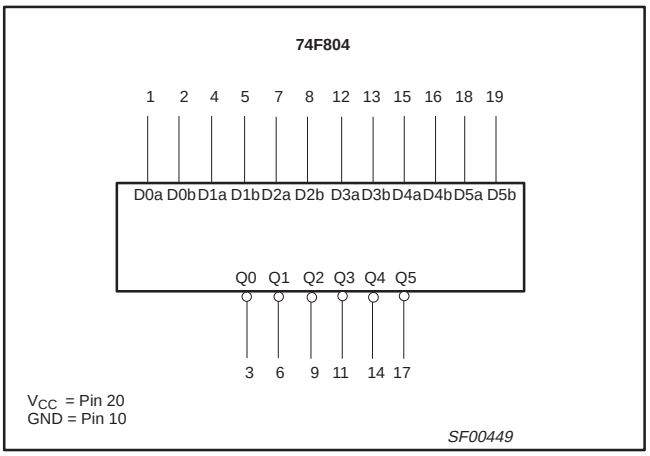
## PIN CONFIGURATION



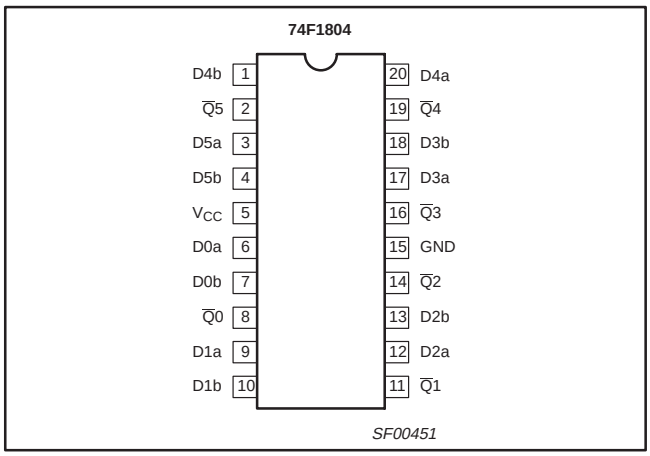

## IEC/IEEE SYMBOL



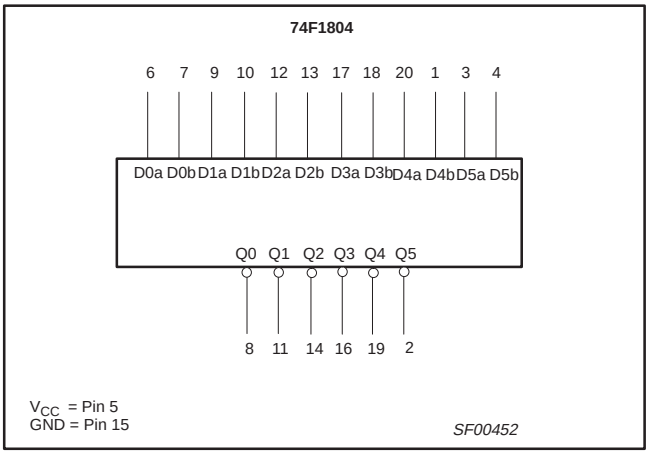

## LOGIC SYMBOL



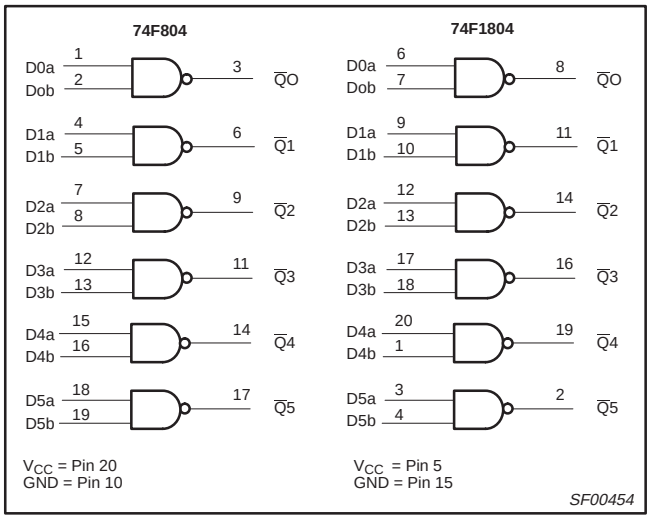

## PIN CONFIGURATION



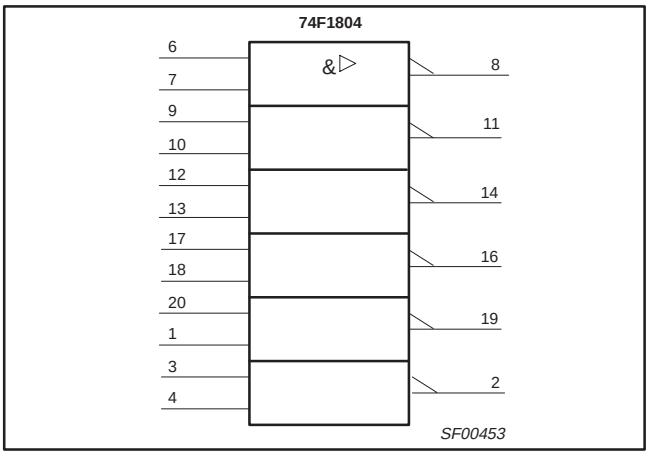
## LOGIC SYMBOL




## LOGIC DIAGRAM




## IEC/IEEE SYMBOL




## FUNCTION TABLE

| INPUTS | | OUTPUT |
|---|---|---|
| **Da** | **Db** | $\overline{\mathbf{Q}}$ |
| H | H | L |
| L | X | H |
| X | L | H |

**NOTES:**
H = High voltage level
L = Low voltage level
X = Don't care

## ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limit set forth in this table may impair the useful life of the device. Unless otherwise noted these limits are over the operating free air temperature range.)

| SYMBOL | PARAMETER | RATING | UNIT |
|---|---|---|---|
| $V_{CC}$ | Supply voltage | –0.5 to +7.0 | V |
| $V_{IN}$ | Input voltage | –0.5 to +7.0 | V |
| $I_{IN}$ | Input current | –30 to +5 | mA |
| $V_{OUT}$ | Voltage applied to output in high output state | –0.5 to $V_{CC}$ | V |
| $I_{OUT}$ | Current applied to output in low output state | 96 | mA |
| $T_{amb}$ | Operating free–air temperature range | 0 to +70 | °C |
| $T_{stg}$ | Storage temperature range | –65 to +150 | °C |

## RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | LIMITS | | | $T_A$ = –40 to +85°C |
|---|---|---|---|---|---|
| UNIT | | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | 4.5 | 5.0 | 5.5 | V |
| $V_{IH}$ | High–level input voltage | 2.0 | | | V |
| $V_{IL}$ | Low–level input voltage | | | 0.8 | V |
| $I_{Ik}$ | Input clamp current | | | –18 | mA |
| $I_{OH}$ | High–level output current | | | –48 | mA |
| $I_{OL}$ | Low–level output current | | | 48 | mA |
| $T_{amb}$ | Operating free air temperature range | 0 | | +70 | °C |

## DC ELECTRICAL CHARACTERISTICS

(Over recommended operating free-air temperature range unless otherwise noted.)

| SYMBOL | PARAMETER | | TEST CONDITIONS[1] | | LIMITS | | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP[2] | MAX | |
| $V_{OH}$ | High-level output voltage | | $V_{CC}$ = MIN, $V_{IL}$ = MAX | ±10%$V_{CC}$ | 2.0 | | | V |
| | | | $V_{IH}$ = MIN, $I_{OH}$ = MAX | ±5%$V_{CC}$ | 2.0 | | | V |
| $V_{OL}$ | Low-level output voltage | | $V_{CC}$ = MIN, $V_{IL}$ = MAX | ±10%$V_{CC}$ | | 0.38 | 0.55 | V |
| | | | $V_{IH}$ = MIN, $I_{OL}$ = MAX | ±5%$V_{CC}$ | | 0.38 | 0.55 | V |
| $V_{IK}$ | Input clamp voltage | | $V_{CC}$ = MIN, $I_I$ = $I_{IK}$ | | | -0.73 | -1.2 | V |
| $I_I$ | Input current at maximum input voltage | | $V_{CC}$ = MAX, $V_I$ = 7.0V | | | | 100 | µA |
| $I_{IH}$ | High–level input current | | $V_{CC}$ = MAX, $V_I$ = 2.7V | | | | 20 | µA |
| $I_{IL}$ | Low–level input current | | $V_{CC}$ = MAX, $V_I$ = 0.5V | | | | -20 | µA |
| $I_O$ | Output current[3] | | $V_{CC}$ = MAX | | -60 | | -160 | mA |
| $I_{CC}$ | Supply current (total) | $I_{CCH}$ | $V_{CC}$ = MAX | $V_{IN}$ = GND | | 2.0 | 3.0 | mA |
| | | $I_{CCL}$ | $V_{CC}$ = MAX | $V_{IN}$ = 4.5V | | 15 | 20 | mA |

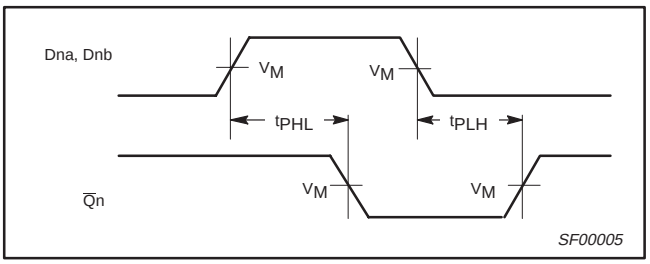
**NOTES:**
1. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
2. All typical values are at $V_{CC}$ = 5V, $T_{amb}$ = 25°C.
3. The output conditions have been chosen to produce a current that closely approximates one half of the true short–circuit output current, $I_{OS}$.

## AC ELECTRICAL CHARACTERISTICS

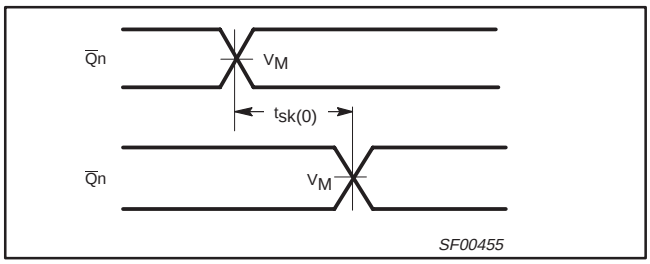
| SYMBOL | PARAMETER | TEST CONDITION | LIMITS | | | | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | $T_{amb}$ = +25°C, $V_{CC}$ = +5.0V, $C_L$ = 50pF, $R_L$ = 500Ω | | | $T_{amb}$ = 0°C to +70°C, $V_{CC}$ = +5.0V ± 10%, $C_L$ = 50pF, $R_L$ = 500Ω | | |
| | | | MIN | TYP | MAX | MIN | MAX | |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation delay<br>Dna, Dnb to $\overline{Q}$n | Waveform 1 | 1.0<br>1.0 | 2.0<br>3.0 | 4.0<br>4.5 | 1.0<br>1.0 | 4.0<br>5.0 | ns |
| $t_{sk(o)}$ | Output skew[1,2] | Waveform 2 | | | 1.5 | | 1.5 | ns |

**NOTES:**
1. [$t_{PN}$ actual – $t_{PM}$ actual] for any output compared to any other output where N and M are either LH or HL.
2. Skew times are valid only under same test conditions (temperature, $V_{CC}$, loading, etc.,).

## AC WAVEFORMS



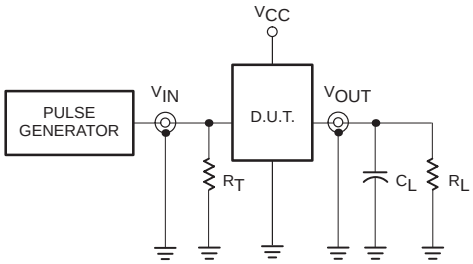

**Waveform 1. Propagation delay for inverting outputs**



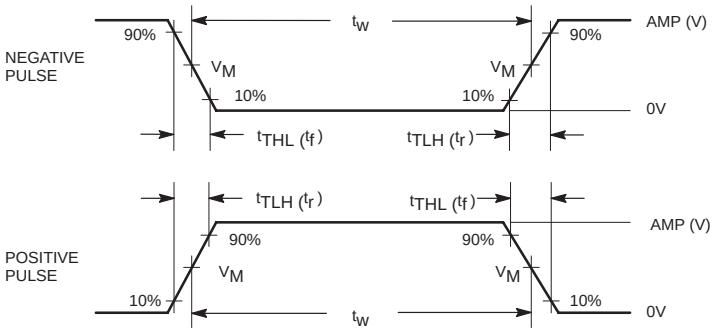

**Waveform 2. Output skew**

**NOTE:** For all waveforms, $V_M$ = 1.5V.

## TEST CIRCUIT AND WAVEFORMS




**Test Circuit for Totem-Pole Outputs**




**DEFINITIONS:**

$R_L$ = Load resistor; see AC ELECTRICAL CHARACTERISTICS for value.

$C_L$ = Load capacitance includes jig and probe capacitance; see AC ELECTRICAL CHARACTERISTICS for value.

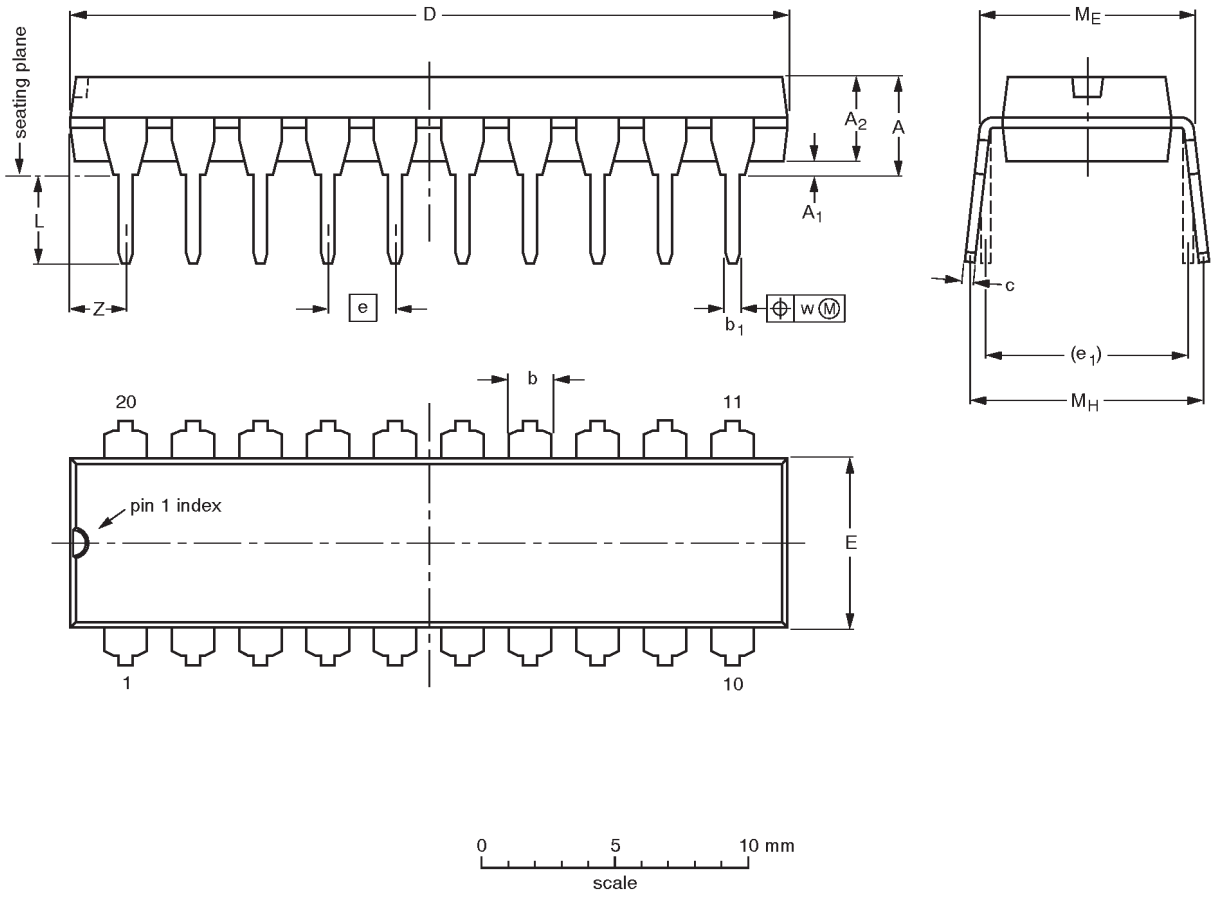
$R_T$ = Termination resistance should be equal to $Z_{OUT}$ of pulse generators.

**Input Pulse Definition**

| family | INPUT PULSE REQUIREMENTS | | | | | |
|---|---|---|---|---|---|---|
| | amplitude | $V_M$ | rep. rate | $t_W$ | $t_{TLH}$ | $t_{THL}$ |
| 74F | 3.0V | 1.5V | 1MHz | 500ns | 2.5ns | 2.5ns |

SF00006

**DIP20: plastic dual in-line package; 20 leads (300 mil)** **SOT146-1**




**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

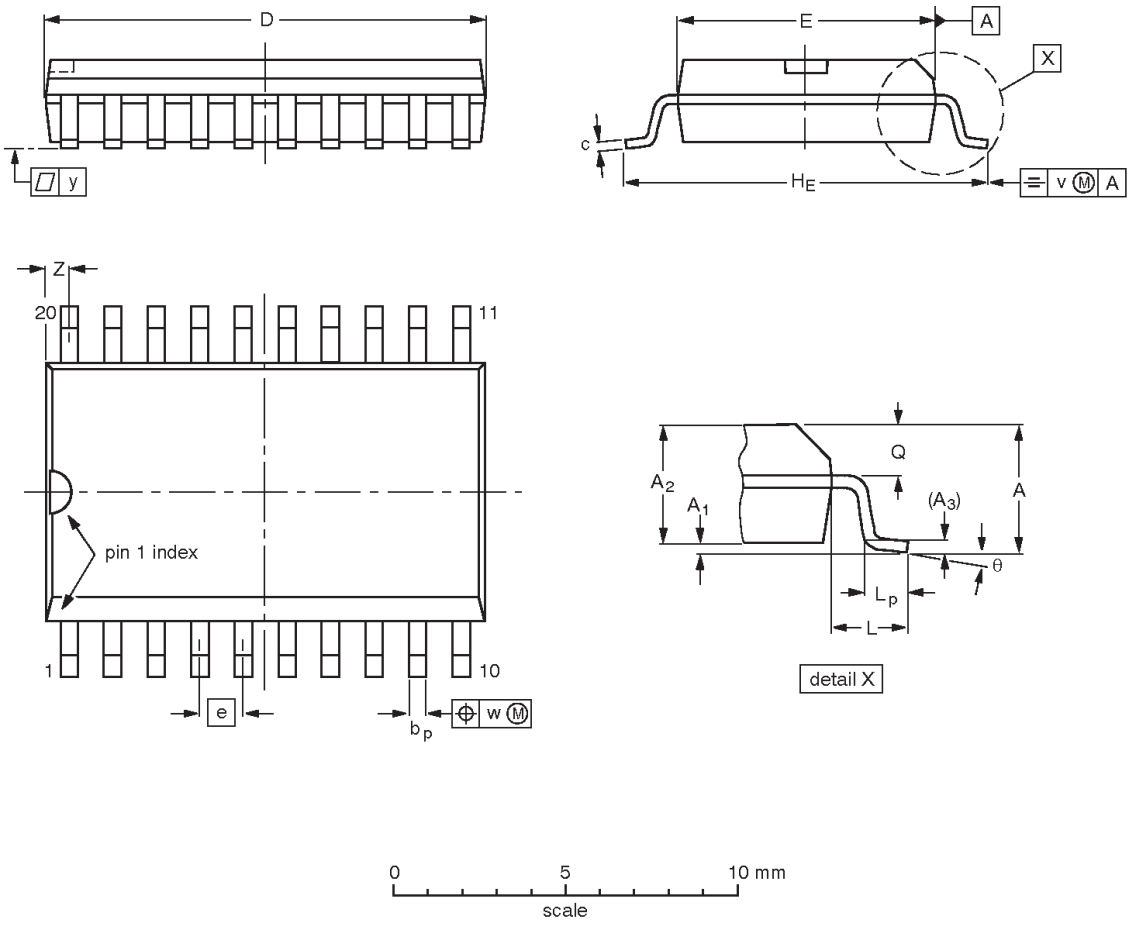
| UNIT | A max. | $A_1$ min. | $A_2$ max. | b | $b_1$ | c | D (1) | E (1) | e | $e_1$ | L | $M_E$ | $M_H$ | w | Z (1) max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 4.2 | 0.51 | 3.2 | 1.73<br>1.30 | 0.53<br>0.38 | 0.36<br>0.23 | 26.92<br>26.54 | 6.40<br>6.22 | 2.54 | 7.62 | 3.60<br>3.05 | 8.25<br>7.80 | 10.0<br>8.3 | 0.254 | 2.0 |
| inches | 0.17 | 0.020 | 0.13 | 0.068<br>0.051 | 0.021<br>0.015 | 0.014<br>0.009 | 1.060<br>1.045 | 0.25<br>0.24 | 0.10 | 0.30 | 0.14<br>0.12 | 0.32<br>0.31 | 0.39<br>0.33 | 0.01 | 0.078 |

**Note**

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | EIAJ | | | |
| SOT146-1 | | | SC603 | | | ~~92-11-17~~<br>95-05-24 |

**SO20: plastic small outline package; 20 leads; body width 7.5 mm** **SOT163-1**




**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(1)}$ | e | $H_E$ | L | $L_p$ | Q | v | w | y | $Z^{(1)}$ | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 2.65 | 0.30<br>0.10 | 2.45<br>2.25 | 0.25 | 0.49<br>0.36 | 0.32<br>0.23 | 13.0<br>12.6 | 7.6<br>7.4 | 1.27 | 10.65<br>10.00 | 1.4 | 1.1<br>0.4 | 1.1<br>1.0 | 0.25 | 0.25 | 0.1 | 0.9<br>0.4 | $8^o$<br>$0^o$ |
| inches | 0.10 | 0.012<br>0.004 | 0.096<br>0.089 | 0.01 | 0.019<br>0.014 | 0.013<br>0.009 | 0.51<br>0.49 | 0.30<br>0.29 | 0.050 | 0.419<br>0.394 | 0.055 | 0.043<br>0.016 | 0.043<br>0.039 | 0.01 | 0.01 | 0.004 | 0.035<br>0.016 | |

**Note**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | EIAJ | | | |
| SOT163-1 | 075E04 | MS-013AC | | | | ~~95-01-24~~<br>97-05-22 |

## Data sheet status

| Data sheet status | Product status | Definition [1] |
|---|---|---|
| Objective specification | Development | This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice. |
| Preliminary specification | Qualification | This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make chages at any time without notice in order to improve design and supply the best possible product. |
| Product specification | Production | This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product. |

[1] Please consult the most recently issued datasheet before initiating or completing a design.

## Definitions

**Short-form specification —** The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition —** Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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